A modified technique for iliac artery branched endografting using a "tromboned" sheath

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The iliac branched device (IBD) is the only totally endovascular option to preserve flow to the internal iliac artery for the treatment of aorto-iliac or solitary iliac artery aneurysms. This technique involves the use of two parallel guide wires, including the indwelling through-and-through wire and a wire to introduce the bridging stent-graft. We describe a technique which uses "tromboned" sheaths (ie, a 7F ANL 1 inside a 10F Balkin sheath) for increased cross-over stability and avoids problems associated with the use of parallel wires inside one sheath. In addition, reduction of the gap between the IBD and the origin of the internal iliac artery may result in a more stable position of the device. (J Vasc Surg 2008;48:1605-8.)

Iliac branched stent-grafting is an endovascular technique to preserve flow into one or both internal iliac arteries (IIA). The technique can be used in aorto-iliac aneurysms in conjunction with the Zenith stent-graft (Cook Inc., Bloomington, Ind) or in solitary iliac artery aneurysms with extension to the iliac bifurcation. Although the literature is not completely in agreement with regard to the risk of complications after intentional sacrifice of one or both IIAs, it is clear that a number of patients will suffer from ischemic complications. The most common complication is buttock claudication, which can occur in up to 30% of the patients.[1] More severe ischemic events like colon or buttock ischemia, however, are rare.

This technique, using an iliac branched device (IBD), is the only totally endovascular option available to preserve flow in the IIA. Other techniques have been used such as surgical relocation of the IIA, or the external to internal iliac artery stent-graft with surgical cross-over bypass. However, these procedures are far more invasive compared to any endovascular procedure. Two types of IBD have been used and their respective results have been published recently.[2-7] One IBD consists of a 12 mm tubular stent-graft with a 6 or 8 mm helical side branch attached. The side branch is wrapped around the tubular graft in a 150° circumference.[4] The second IBD type is based on the Zenith TFLE leg extension (Cook Inc), with a proximal diameter of 12 mm and a distal diameter of 10 or 12 mm. The straight side branch, 8 mm in diameter and 21 mm long, is attached to the tube in a 30° angle.[2,3,6,7] Both types of IBD seem to present with some minor advantages and disadvantages but they have not been compared up to now. They both involve the use of a preloaded indwelling wire that passes through the internal iliac branch. This indwelling wire can be advanced and snared from the contralateral side. This through-and-through cross-over wire enables the advancement of a stent-graft from the contralateral side to bridge the gap between the iliac branch and the IIA. For the introduction of this bridging stent-graft, a stable position of the cross-over sheath is mandatory. Therefore, it has been advised to keep the through-and-through indwelling wire in position until the bridging stent-graft is in place. This requires working with parallel wires through one sheath, and can cause problems due to friction and entangling.

To solve this problem, we developed a modified technique which allows working in a co-axial way at all times, with a lower risk of intra-operative technical complications. For completeness, we report that the technique was used in the IBD with the straight side branch only.

TECHNIQUE

The technique requires standard bilateral femoral artery access. Introduction of the 20F IBD is achieved through the ipsilateral femoral artery. The indwelling wire is snared from the contralateral femoral artery, to achieve a through-and-through cross-over access. After angiography, the body and side branch of the IBD are deployed, but the ipsilateral limb of the IBD is kept constrained inside the sheath (Fig 1). This allows for later repositioning if needed. A 40 cm 10F flexor cross-over guiding sheath (Balkin, William Cook Europe, Bjaeverskov, Denmark) is introduced over the aortic bifurcation and into the body of the IBD. Then a 55 cm 7F flexor guiding sheath (ANL1, William Cook Europe) is advanced through the 10F sheath into the iliac side branch of the IBD. This "trombone" technique results in a stable position to

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Competition of interest: Eric Verhoeven has received royalties and is a consultant for William Cook Europe.

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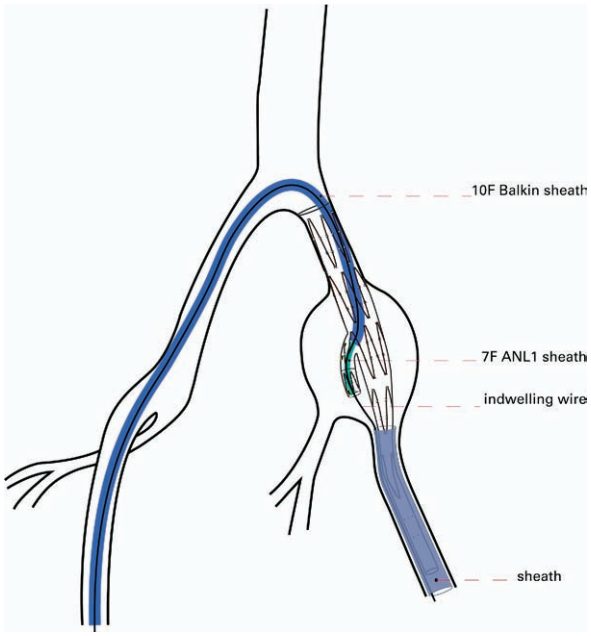

Fig 1. Body and side branch of iliac branched device deployed. The ANL sheath is introduced inside the Balkin sheath (cross-over "trombone" technique).

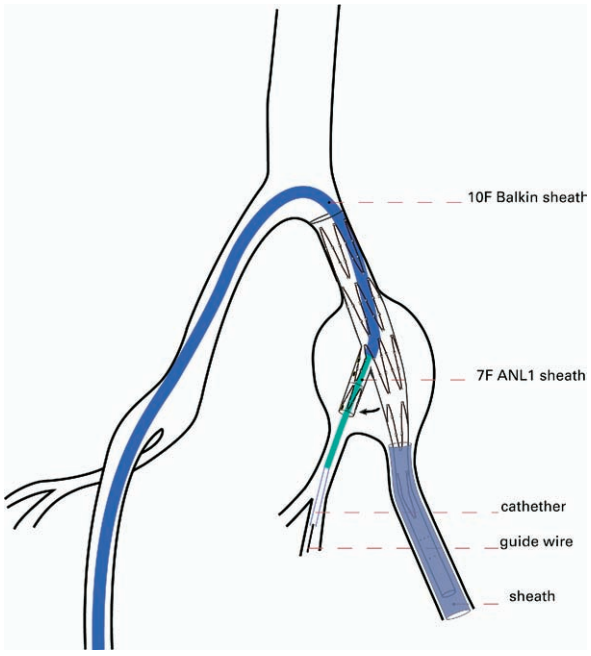

Fig 2. Indwelling wire removed. This opens up the iliac branch limb (*black arrow*). The ANL 1 sheath is advanced inside the internal iliac artery.

work with. The indwelling through-and-through wire can now be removed (Fig 2). This maneuver will result in the iliac branch limb opening up, thus facilitating catheterization of the IIA. After catheterization of the IIA, a stiffer wire (Amplatz super stiff, Cook Inc) is inserted and the ANL 1 guiding sheath advanced inside the IIA. In order to reduce the gap between the side branch and the orifice of the IIA, the IBD can be retracted over the two rails formed by the ANL 1 and the main introduction device (Fig 3).

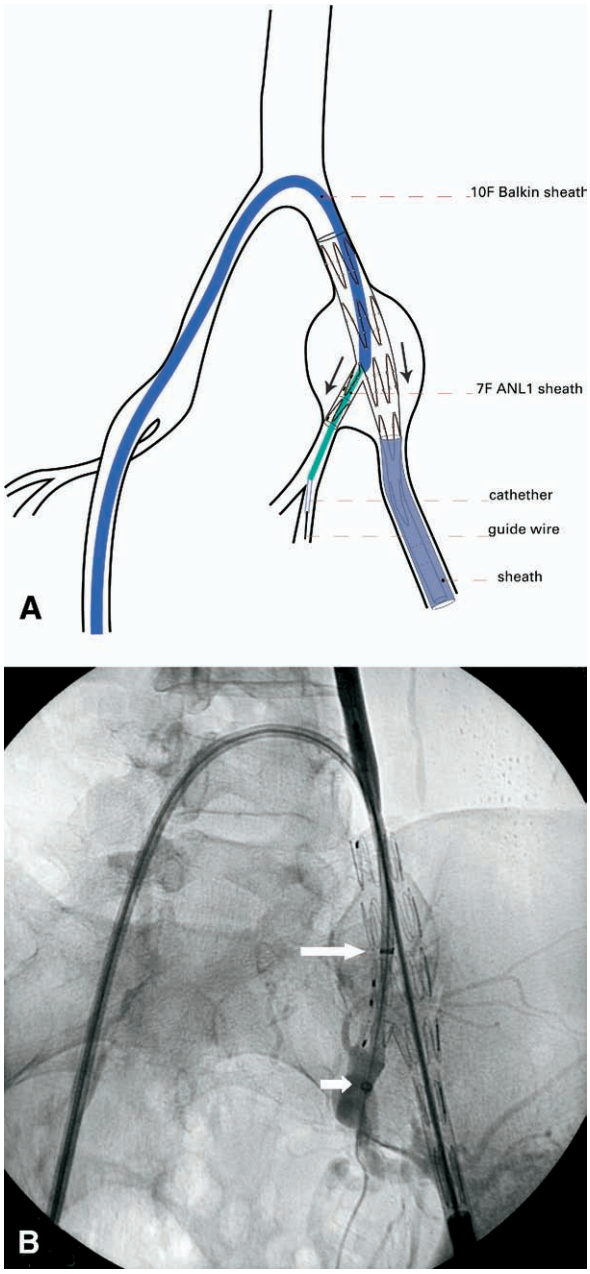

Fig 3. A, Iliac branched device retracted (black arrows) over two rails (the ANL sheath and the main introduction device). **B,** Intraoperative angiogram showing the situation as in figure 3A with partially deployed iliac branched device (proximal part and branch), cross over 10 F Balkin sheath (long arrow) with 7 F ANL sheath inside (short arrow). Guide wire inside the internal iliac artery. The external part of the device is still constrained in the sheath.

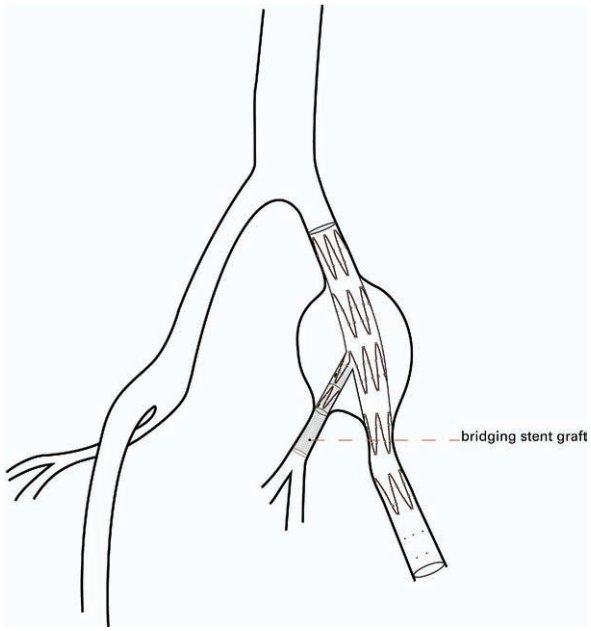

Fig 4. Ipsilateral limb of the iliac branched device deployed and the bridging stent-graft introduced and deployed.

Fig 5. Completion angiogram showing unrestricted flow to the internal iliac artery.

To conclude the procedure, the ipsilateral limb of the IBD is deployed and the bridging stent-graft introduced (Figs 4 and 5). Deploying the bridging stent-graft will cross the gap between the side branch and the ostium of the IIA.

Since the introduction of this modified technique, 13 patients with a mean age of 65.3 years have received 14 IBDs for treatment of solitary iliac artery aneurysms (n = 3) or aortoiliac aneurysms (n = 11). Initial technical success was 100% with complete exclusion of the aneurysm and an open IIA at the end of the procedure.

DISCUSSION

This report describes the use of a "trombone" technique which allows for early removal of the indwelling wire. It was devised as an easier and safer technique to get a bridging stent-graft from the contralateral femoral side into the IIA, as compared to the technique that was published so far in several reports.

The indwelling wire is an integral part of the IBD and runs outside the external iliac part, through the iliac side branch and inside the common iliac part of the device. This indwelling wire is snared from the contralateral side and thus becomes a through-and-through wire. The use of the "trombone" technique should provide a stable position of the cross-over sheaths as discussed. The advantages following the removal of the indwelling wire are threefold. First, the iliac limb will naturally open up and face the orifice of the IIA. Second, the IBD can be retracted carefully over the two rails which will reduce the gap and stabilize the position of the IBD. Third, in this way a much shorter bridging stent-graft can be chosen. Indeed, about 1.5-2 cm overlap and the same length inside the IIA will suffice with the graft in such a stable position. This should avoid kinking of the balloon expansion and fairly stiff bridging stent-graft and occlusion of the IIA.

Only a few reports on the use of the IBD have been published so far.[2-7] In these reports, a different technique is described for the insertion of the bridging stent-graft. The guiding sheath is only advanced up to the level of the side branch. With the purpose to keep the cross-over sheath in position, the indwelling wire is kept in place and a second guide wire is used alongside the first one for catheterization of the IIA and introduction of the bridging stent-graft. Using this technique in earlier cases resulted in technical problems such as extreme difficulty to advance the bridging stent-graft inside the IIA, probably due to friction and/or entangling of the wires. Using more force did not help and several times even luxated the cross-over sheath. In our early experience we also used far longer bridging stent-grafts to achieve a longer sealing zone in the IIA but this resulted in kinking and occlusion in three cases.

CONCLUSION

We have abandoned the standard technique for use of the IBD in favor of a modified technique which uses "tromboned" sheaths for stability and avoids the potential problems with the use of parallel wires inside one sheath. With maximal reduction of the gap by retraction of the IBD and selection of a shorter bridging stent-graft, one can achieve a stable position of the device and avoid kinking and risk of occlusion of the IIA.

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